IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of)	
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Ann-Christine ERIKSSON)	Group Art Unit: 2681
)	
Application No.: 10/041,581)	Examiner: Unassigned
)	
Filed: January 10, 2002)	
)	
For: TELECOMMUNICATIONS SYSTEMS)	

CLAIM FOR CONVENTION PRIORITY

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

The benefit of the filing date of the following prior foreign application in the following foreign country is hereby requested, and the right of priority provided in 35 U.S.C. § 119 is hereby claimed:

United Kingdom Patent Application No. 0100789.7

Filed: January 11, 2001

In support of this claim, enclosed is a certified copy of said prior foreign application. Said prior foreign application was referred to in the oath or declaration. Acknowledgment of receipt of the certified copy is requested.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

Date: April 25, 2002

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(03/01)

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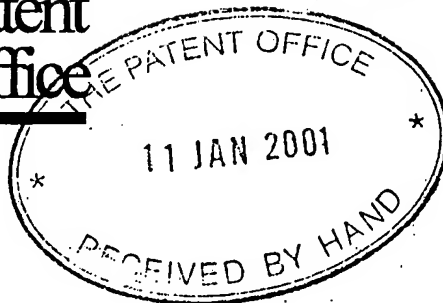
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Signed *R. Mahoney*

Dated 5 December 2001

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1.	Your reference	HL77795/000/CIV

2.	Patent application number *(The Patent Office will fill in this part)*	**0100789.7**

3.	Full name, address and postcode of the or of each applicant *(underline all surnames)*	TELEFONAKTIEBOLAGET L M ERICSSON (PUBL) SE-126 25 STOCKHOLM Sweden
		7850399001
	Patents ADP number *(if you know it)* If the applicant is a corporate body, give the country/state of its incorporation	Sweden

4.	Title of the invention TELECOMMUNICATIONS SYSTEMS	

5.	Full name of your agent *(if you have one)*	Haseltine Lake & Co.
	"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*	Imperial House 15-19 Kingsway London WC2B 6UD
	Patents ADP number *(if you know it)*	34001

		Country	Priority application number *(if you know it)*	Date of filing *(day/month/year)*
6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number			

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7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application			

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11.	I/We request the grant of a patent on the basis of this application
	Signature	Date 10 January 2001

12. Name and daytime telephone number of person to contact in the United Kingdom	Mr. C.I. Vigars	[0117] 9103200

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TELECOMMUNICATIONS SYSTEMS

The present invention relates to
telecommunications systems, and in particular to
5 digital mobile telephone systems.

Background of the Invention

In a GPRS (General Packet Radio System) network a
mobile station (MS) may have several packet data flows
10 running at the same time. Each flow is known as a
packet data protocol (PDP) context. Typically one PDP
context would be run per application type or per
destination. The packet data flows may have different
quality of service (QoS) levels and different
15 destination points. In data flows between the serving
GPRS support node (SGSN) and the base station system
(BSS), two or more PDP contexts may be grouped together
to form a packet flow context (PFC) if they are of
similar QoS. The similar QoS profiles for the PDP
20 contexts that form a PFC are grouped into an aggregate
QoS profile. In the BSS, the PFC is treated as one
flow and no knowledge of the individual PDP context is
available. If the MS has several PDP contexts with
different QoS, there will be several PFC's to the same
25 MS. For each packet data flow the QoS profile
specifies the priority, guaranteed bit rate, guaranteed
delay etc. The attributes in the QoS per PDP context
are used when scheduling the MS in the SGSN. In the
BSS the aggregate QoS for a PFC is used to schedule the
30 MS on the radio interface.

The data flow between the SGSN and the BSS is
controlled per BVCI (BSSGP virtual connection
identifier) and per MS with a flow control mechanism.
The rate of the data flow through the BSS from the SGSN
35 is determined by the transmission rate on the radio

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interface to each MS.

The current GSM standard gives possibilities to control the data flow between the SGSN and the BSS per BVCI and per MS. An MS may have data flows running for several PFC's at the same time. The sum of these data flows to one MS is controlled with the flow control mechanism.

However, when the data flow to the BSS is only controlled per MS and per BVCI, the BSS has no possibility to inform the SGSN to increase or decrease the rate of data flow per PFC. This causes congestion for mobile stations with data flows of different QoS. The reason for this is that the MS buffers in the BSS may be filled with data for flows with low priority or low guaranteed bit rate and delay. The BSS then notifies the SGSN to decrease or to stop the data flow for this MS. Thus the SGSN cannot send new data for this MS to the BSS even if the data has high priority or high demands on throughput and delay.

More information concerning the current solution can be found in 3GPP TS 08.18v.8.7.0.

Summary of the Present Invention

An object of the present invention is to introduce an extended and improved flow control mechanism, which is more flexible than the prior art flow control mechanisms in mobile communications systems having a packet data transmission capability.

Another object of the present invention is a flow control mechanism that provides support for the QoS requirements in mobile communications systems having a packet data transmission capability.

According to the present invention, the data flow is controlled per packet data flow defined by an aggregate QoS profile in addition to being controlled

per MS and per cell identity. The data flow may then
be increased or decreased depending on the aggregate
QoS of the packet data flows for a mobile station. An
MS may have several packet data flows with respective
aggregate QoS. For an MS, the data flow may be
increased for a packet flow having an aggregate QoS
with high priority or high requirements on throughput
or delay. At the same time, the data flow may be
decreased for a packet data flow having an aggregate
QoS with low priority or low requirements on throughput
and delay for the same MS.

It is emphasised that the term "comprises" or
"comprising" is used in this specification to specify
the presence of stated features, integers, steps or
components, but does not preclude the addition of one
or more further features, integers, steps or
components, or groups thereof.

Brief Description of the Drawings

Figure 1 is a schematic drawing illustrating data
flows in a GPRS mobile telephone network;

Figure 2 illustrates flow control buffers; and

Figure 3 illustrates flow control in a GPRS mobile
telephone system.

Detailed Description of the Preferred Embodiment

A solution to overcome the problem of data flow
control in a GPRS network is to control data flow per
packet flow context of a mobile station in addition to
controlling the flow per mobile station and per BVCI.
The base station system can then control the data flow
with greater regard to the particular circumstances of
each context. For example, the BSS may decrease the
data flow with low priority or low guaranteed bit rate
and delay and at the same time increase the data flow

with high priority or high guarantee bit rate and delay for the same mobile station.

In the BSS there are several PFC's stored, one for each aggregate QoS per MS. Some PFC's may be of the same type - Conversational, Streaming, interactive or Background. The BSS shall control the data flow from the SGSN per BVCI and per MS, and also per PFC or per PFC type of a MS. If one MS has several PFC's of the same type, the data flow to these PFC's may be controlled together.

Figure 1 illustrates flow control per BVCI, individual MS and individual PFC per MS. The flow control mechanism conforms to a leaky bucket algorithm. The bucket has a size, a bucket full ratio and a leak rate. The leak rate corresponds to the rate at which the data flows on the radio interface in a cell.

In the BSS the bucket consists of a buffer for every BVCI, individual MS and also for every individual PFC per MS, see Figure 2. The BSS controls the data flow from the SGSN to the BSS by indicating the bucket size, the leak rate of the bucket and the bucket full ratio per BVC, per individual MS and also per individual PFC of a MS.

Figure 2 illustrates the buffers in the BSS for which flow control is applied.

The buffers in the BSS are filled with data sent by the SGSN. The BSS empties the buffers according to the QoS for each PFC and MS. With the addition of flow control per PFC, the SGSN gets information about how much data each PFC buffer of a MS contains. Without this information the SGSN would not know what type of data each MS buffer contains. With flow control also per PFC both the SGSN and the BSS get better control of the data flows in a BVC and they are able to promote data flows with high priority or high demands on

bitrate and delay.

　　　　When an MS buffer is almost full the data flow for
one PFC of that MS may be decreased, while the other
data flows are maintained. Thus giving the possibility

5　　　to limit the data flow for low priority PFC's or PFC's
with low bitrate and delay requirements. For example,
the data flow for a Background PFC may be decreased or
even stopped in order to be able to fulfil the
guaranteed bitrate and delay for a data flow of

10　　　Streaming PFC.

　　　　Figure 3 illustrates Flow Control in a GPRS
system.

　　　　Data for a specific PFC belonging to an MS that is
located in a BVC is sent from the SGSN to the BSS. The

15　　　BSS may control the data flow per BVCI, individual MS
and also per individual PFC for an MS. The additional
flow control indication per PFC for each mobile station
may for example be included in one of the existing flow
control messages per BVCI or per MS, or it may

20　　　construct a new message that is sent between the BSS
and the SGSN. The PFC flow control information may
consist of for example PFC bucket size, PFC bucket leak
rate and PFC bucket full ratio. PFC's of the same type
to one mobile station may be controlled together.

25　　　The embodiment of the present invention makes it
possible to differentiate data flows with different
quality of service levels for the same mobile station.
Each data flow for each mobile station is treated
separately according to its quality of service in the

30　　　BSS.

CLAIMS:

1.   A method of controlling data flow in a telecommunications network in which a base station communicates with a mobile station using a plurality of packet data flows, the packet data flows having respective data flow rates, wherein the method comprises controlling data flow through the network by controlling the data flow rate of each packet data flow, an overall data flow rate to the mobile station and a data flow rate for each base station.

2.   A method as claimed in claim 1, wherein the packet data flow is controlled in dependence upon a quality of service level associated therewith.

3.   A method as claimed in claim 1, wherein the packet data flows are channelled through respective buffers which are operable to receive, store and output data from the associated packet data flows, the packet data flows being controlled such that data output from the buffers is dependant upon the quality of service level for the packet data flow concerned.

4.   A method as claimed in claim 1, wherein the packet data flows are packet flow contexts (PFCs).

5.   A method as claimed in claim 4, wherein the data flow for a base station is a BVCI connection (BSSGP virtual connection identifier).

6.   A method as claimed in any one of claims 1 to 5, wherein the network is a GPRS network.

7.   A telecommunications network comprising a base station which is operable to communicate with a mobile station using a plurality of packet data flows associated with the mobile station, each packet data flow having a data flow rate, wherein the base station is operable to control data flow to a mobile station by controlling the data flow rates of the packet data flows associated with the mobile station concerned.

8. A network as claimed in claim 7, wherein the packet data flow is controlled in dependence upon a quality of service level associated therewith.

9. A network as claimed in claim 7 or 8, wherein the packet data flows are channelled through respective buffers which are operable to receive, store and output data from the associated packet data flows, the packet data flows being controlled such that data output from the buffer is dependent upon the quality of service level for the packet data flow concerned.

10. A network as claimed in claim 7, 8 or 9, wherein the packet data flows are packet data flow contexts (PFCs).

11. A network as claimed in claim 10, wherein the packet data flow for a base station is a BVCI connection (BSSGP virtual connection identifier).

12. A network as claimed in any one of claims 7 to 11, wherein the network is a GPRS network.

13. A base station apparatus for use in a telecommunications network, the base station apparatus including a data flow control unit which is operable to control packet data flow communication with a mobile station by controlling the data flow rates of packet data flows associated with the mobile station concerned.

ABSTRACT

TELECOMMUNICATIONS SYSTEMS

5   A method is disclosed for controlling data flow in a
     telecommunications network in which a base station
     communicates with a mobile station using a plurality of
     packet data flows, the packet data flows having
     respective data flow rates. The method comprises
10   controlling data flow through the network by
     controlling the data flow rate of each packet data
     flow, an overall data flow rate to the mobile station
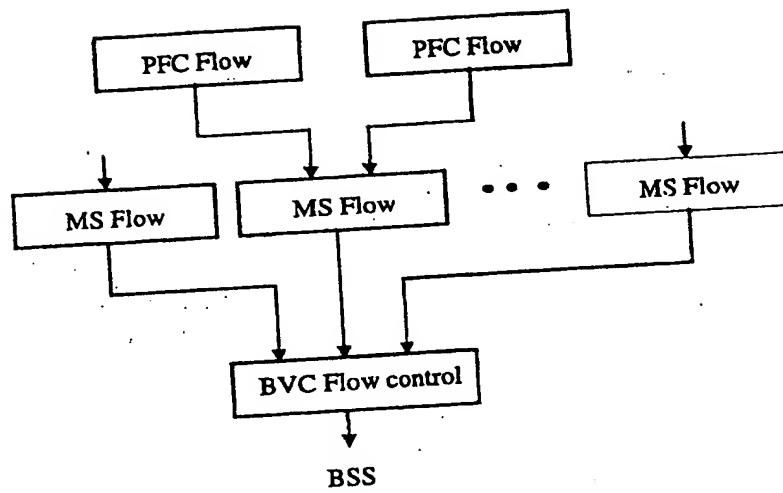   and a data flow rate for each base station.
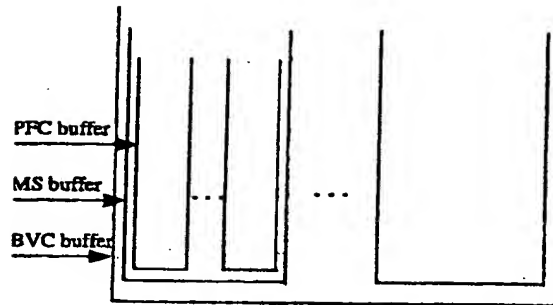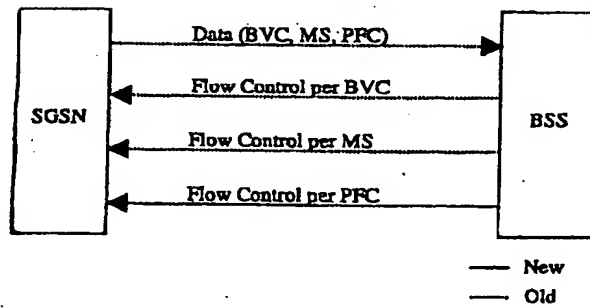
15   [Figure 1]

FIGURE 1

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PFC buffer

MS buffer

BVC buffer

FIGURE 2

Data (BVC, MS, PFC)

Flow Control per BVC

SGSN

Flow Control per MS

BSS

Flow Control per PFC

—— New
—— Old

FIGURE 3

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